

### SUMMARIES OF SCIENTIFIC/TECHNICAL ARTICLES

#### **Influence of stroke-related impairments on performance in 6-minute walk test**

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Subashan Perera, PhD; Wen Liu, PhD; Sue Min Lai, PhD;

Stephanie Studenski, MD; Jason Long, MS

**Purpose of the Work.** The 6-minute walk test is a clinical measure of endurance, but it is not known if the test is appropriate for adults who have had a stroke. The purposes of this study were to evaluate what physical problems after a stroke influence performance on the 6-minute walk test and to determine if this test provides a measure of walking endurance for stroke survivors. **Subjects/Procedures.** Seventy-two adults who had an average age of 72 years walked for 6 minutes. They were instructed to cover as much ground as possible in the time allotted. The sensation and motor abilities of their affected lower limb were quantified with the use of a clinical test, the Fugl-Meyer Assessment. A standardized clinical test was used to measure their balance. **Results.** Subjects walked an average distance of 216 m. The motor ability of the lower limb and the balance score were significant predictors of the distance subjects could walk. The average pulse and systolic blood pressure were higher at the end of the 6-minute walk test, compared to the beginning of the walk. **Relevance to the Veteran Population.** After a stroke, the distance walked in 6 minutes is limited by physical impairments. Taking the pulse and blood pressure before and after the walk is recommended for one to assess the safety of distance walking for stroke survivors and to gain insight into the individual's endurance for walking.

*Patricia S. Pohl, PhD, PT*

#### **Activation of intentional mechanisms through utilization of nonsymbolic movements in aphasia rehabilitation**

Katherine Richards, MS; Floris Singletary, MS;

Leslie J. Gonzalez Rothi, PhD; Shirley Koehler, PhD;

Bruce Crosson, PhD

**Purpose of the Work.** Deficits demonstrated in nonfluent aphasia may be a result of a disconnection between or damage to the initiation (intention) and production mechanisms in the left hemisphere. A treatment designed to engage

intact right-hemisphere intention mechanisms was tested for efficacy in improving naming accuracy in patients with nonfluent aphasia. **Subjects/Procedures.** Three subjects with stable, chronic nonfluent aphasia were trained by a therapist to perform a complex nonsymbolic movement sequence with their nondominant hand prior to naming. Subject performance was measured on a naming probe administered at each of the 39 sessions. **Results.** A stable baseline period was established for all subjects before treatment initiation. All three subjects demonstrated a significant improvement in naming accuracy when compared to baseline performance. **Relevance to the Veteran Population.** Those with chronic nonfluent aphasia may demonstrate enhanced word production accuracy following a treatment designed to engage right-hemisphere intention mechanisms.

*Katherine Richards, MS*

#### **Effects of two lexical retrieval cueing treatments on action naming in aphasia**

Julie L. Wambaugh, PhD; Patrick J. Doyle, PhD;

Aida L. Martinez, MA; Michelene Kalinyak-Fliszar, MS

**Purpose of the Work.** This investigation was designed to examine the effects of two cueing treatments on action naming in aphasia. The treatments used were termed "phonological cueing treatment" (PCT) and "semantic cueing treatment" (SCT) because the cues comprising the treatments were designed to facilitate retrieval at the lexical-phonological and lexical-semantic levels, respectively. Both treatments had been demonstrated to be effective in promoting object naming with the study's participants. Action naming has not been studied previously with these two treatments, and one could not assume that effects would be the same as those observed with object naming. Therefore, this investigation was as an indirect replication; that is, the treatments were evaluated with the same participants, but with a different grammatical form class (i.e., verbs instead of nouns). **Subjects/Procedures.** The participants were three speakers with chronic aphasia and clinically significant word-finding difficulties. All speakers had participated in an object-naming treatment investigation before their involvement in this study. They had received both PCT and SCT, which were applied sequentially and repeatedly to four sets of objects in multiple baseline designs. All speakers had responded positively to both treatments. In the current investigation, Speaker 1 received SCT, Speaker 2 received PCT, and Speaker 3 received both SCT and PCT. We used multiple baseline designs across

behaviors with Speakers 1 and 2 and an alternating treatments design with Speaker 3. In keeping with design constraints, we conducted repeated measurements of accuracy of naming of experimental items (i.e., pictured actions) to ensure stability of responding. The treatments were then applied to selected sets of pictured actions, and continuous measurements of naming of treated and untreated items were continued. Follow-up measures were conducted following cessation of treatment. **Results.** Speaker 1's response to SCT applied to verbs was positive. Specifically, he reached criterion rapidly, demonstrating little generalization to unexposed generalization items and moderate generalization to exposed generalization items. Speaker 2 failed to reach criterion with either group of treated verbs. Furthermore, he showed negligible improvement with the second group of verbs, despite having achieved gains of 50% to 60% with the first group of verbs. Speaker 2's gains with Group 1 items were not maintained during Group 2 training. Additionally, he demonstrated minimal changes in exposed and unexposed generalization verbs. Speaker 3 demonstrated consistent, positive improvements with both treatments. That is, he did not exhibit a treatment preference for PCT or SCT applied to verbs. Speaker 3 did not demonstrate generalization to untrained items. **Relevance to the Veteran Population.** Aphasia is a common outcome of stroke. Virtually every individual with aphasia experiences word-finding problems that may significantly interfere with communication. The results of the current investigation will develop effective behavioral treatments for word-finding difficulties. The findings from this investigation are preliminary, but suggest that these cueing treatments may be effective in promoting improved retrieval of action names for some speakers with aphasia. Additionally, the treatments appear to have differential effects on naming of words from different grammatical form classes. Further investigations of these treatments should result in findings that will help clinicians select the most appropriate treatments for persons with aphasia.

*Julie L. Wambaugh, PhD*

#### **Driving performance in patients with mild to moderate glaucomatous clinical vision changes**

Janet P. Szlyk, PhD; Daniel P. Taglia, MD, JD;  
Jennifer Paliga, BS; Deepak P. Edward, MD;  
Jacob T. Wilensky, MD

**Purpose of the Work.** The purpose of this study was to correlate driving-related skills with clinical vision measures in patients with glaucoma. **Subjects/Procedures.** Visual

acuity, visual field extent, and contrast sensitivity data were compared to accidents and driving simulator performance for 25 patients with glaucoma and 29 age-equivalent normally sighted control subjects. **Results.** Of the clinical vision measures, only lower contrast sensitivity correlated with driving skills, including slower speeds, more lane boundary crossings, and longer braking response times. Contrast sensitivity may be an important parameter related to driving for patients with glaucoma who have normal or near-normal visual acuity and mild to moderate visual field loss. **Relevance to the Veteran Population.** Glaucoma is among the top three causes of visual impairment for veterans. It is important to determine the driving skills that may be compromised because of the vision changes resulting from this disease. This information may help guide clinicians when making recommendations about driving for patients with glaucoma.

*Janet P. Szlyk, PhD*

#### **Development and assessment of a neuropsychological battery to aid in predicting driving performance**

Janet P. Szlyk, PhD; Lara Myers, MA;  
Yuan Xia Zhang, PhD; Linda Wetzel, PhD;  
Rita Shapiro, DO

**Purpose of the Work.** The overall purpose of this study was to construct a test battery that had the potential for screening older individuals for driving. Toward this end, the study had two subgoals: (1) determine the tests that are most frequently used by licensed neuropsychologists to screen patients for driving risk and (2) determine if there is a relationship between these neuropsychological tests and driving performance. **Subjects/Procedures.** A survey was sent to 292 licensed neuropsychologists inquiring about the tests most frequently used to gain information about an older patient's driving abilities. From this survey, we used 125 responses to develop a test battery. The data from the test battery administered to 22 licensed drivers (age range, 67 to 91 years) were compared to driving-related skill performance as measured by a driving simulator. **Results.** Trails A and B tests (which measure mental tracking abilities and mental flexibility) and the Logical Memory I Subtest of the Wechsler Memory Scale—Revised (which measures immediate verbal memory abilities) were significantly correlated with the largest number of driving measures, including numbers of out-of-lane events, speed, and braking pressure. **Relevance to the Veteran Population.** With an aging veteran population, clinicians are faced more

frequently with questions from patients and their families about whether one can safely continue to drive. The Department of Veterans Affairs (VA) Rehabilitation Community is faced with the task of developing more accurate and fair measures to identify deficits that may place one at risk while driving.

*Janet P. Szlyk, PhD*

**Development of a mechanical device to replace medicinal leech (*Hirudo medicinalis*) for treatment of venous congestion**

Michael L. Conforti, DVM, MS; Nadine P. Connor, PhD;  
Dennis M. Heisey, PhD; Ray Vanderby, PhD;  
David Kunz, PhD; Gregory K. Hartig, MD

**Purpose of the Work.** Medicinal leeches are currently used to treat venous congestion, a serious complication of reconstructive surgery. This research is focused on developing a mechanical device that is more effective at treating venous congestion. **Procedures.** In a pig model, a congested skin flap was used to test each mechanical device prototype. The pig model is a good representation of the postoperative complication of venous congestion. **Results.** Two of the four mechanical device prototypes developed were more effective at removing blood from the congested flap versus a medicinal leech. Furthermore, the most effective prototype was able to decongest the flap of tissue over a 4-hour period. **Relevance to the Veteran Population.** Reconstructive surgery following cancer removal is frequently performed in Department of Veterans Affairs (VA) hospitals. New technology to effectively treat the postoperative complication of venous congestion would reduce the risk of tissue death and improve the quality of life in VA patients.

*Michael L. Conforti, DVM, MS*

**Augmented blood removal after medicinal leech feeding in congested tissue flaps**

Nadine P. Connor, PhD; Michael L. Conforti, DVM, MS;  
Dennis M. Heisey, PhD; Ray Vanderby, PhD; David  
Kunz, PhD; Gregory K. Hartig, MD

**Purpose of the Work.** Venous congestion is a complication of reconstructive microsurgery that threatens the viability of the affected tissue and often is treated with medicinal leeches. Leech therapy has two phases: active bloodletting and passive bleeding from the leech wound after detachment. Our goal was to develop a device to

augment blood removal during the passive-bleeding phase of leech therapy. **Subjects/Procedures.** A mechanical device was developed and tested for up to 3 hours of passive bleeding. The device consisted of a multiport glass chamber, which was secured over a leech bite after leech detachment with a porcine model of venous congestion. The device was based upon three concepts: (1) pulsate irrigation and chemical anticoagulation, (2) suction, and (3) mechanical agitation of the irrigant. **Results.** Use of the device resulted in significant increases in blood retrieval relative to reports of passive bleeding alone (141%, 156%, and 155% in hours 1, 2, and 3, respectively). **Relevance to the Veteran Population.** Reconstructive microsurgery is performed to reattach, transfer, or transplant body tissues. In cases of venous congestion complications, leech therapy is used, but the use of leeches has several limitations. Most importantly, the small blood volumes removed by medicinal leeches are generally ineffective in decongesting tissue. These results are an encouraging first step toward development of a mechanical device that completely replaces the use of medicinal leeches in modern medicine.

*Nadine P. Connor, PhD*

**Remote monitoring of sitting behavior of people with spinal cord injury**

Duncan Shirreffs Bain, PhD; Martin Ferguson-Pell, PhD

**Purpose of the Work.** To demonstrate the clinical value of the remote monitoring system to monitor the sitting behavior of wheelchair users during their daily lives. **Subjects/Procedures.** A data-logging system has been developed and interfaced to a commercially available pressure mapping system. The unit has been suitably packaged for discreet attachment to any wheelchair. Five wheelchair users aged 19 to 52 were monitored in their daily activities. **Results.** We found that the system is able to identify factors relating to sitting behavior, including pressure relief habits, asymmetry, and other factors. Further work is required with a larger number of subjects to relate these factors to pressure ulcer risk. **Relevance to the Veteran Population.** Many wheelchair users are unable to sense sitting discomfort, which would normally warn them of sitting conditions that may ultimately lead to pressure ulcers. The clinical assessment of risk factors leading to pressure ulcers is normally undertaken in a hospital clinic. However, knowledge of the sitting behavior of the wheelchair user outside the clinic may more realistically and comprehensively identify these factors.

Monitoring sitting behavior in a real-life setting could help develop safer practices through training and increased awareness.

*Duncan S. Bain, PhD*

### **Wheelchair utilization and satisfaction following cerebral vascular accident**

Susan L. Garber, MA, OTR, FAOTA;  
Reynold Bunzel, MOTS; Trilok N. Monga, MD

**Purpose of the Work.** The purpose of this study was to determine the extent to which wheelchairs prescribed during rehabilitation are used and perceived as satisfactorily meeting individual mobility, functional, psychological, and social needs of veterans who have had a stroke. **Subjects/Procedures.** The study population included 49 veterans who had had a stroke and rehabilitation at the Houston Veterans Administration Medical Center (VAMC). Participants were scheduled for a one-time individual interview at the Houston VAMC. At which time, we obtained informed consent. They were requested to respond to questions on demographics, medical status, cognition, and dimensions of handicap, depression, health status and well-being, and on the use of and satisfaction with the wheelchair prescribed during their rehabilitation hospitalization. The interview time ranged from 90 to 120 minutes, and participants were financially compensated for their transportation and time. **Results.** Fifteen participants (31%) no longer used their wheelchairs. Primary reasons included improved physical function (93%) and use of alternative mobility aids (87%). Use by continued wheelchair users ranged from less than 1 hour each day (29%) to more than 8 hours each day (3%). Participants who retained use of the wheelchair were satisfied with its performance. Continued use was associated with impaired mobility, physical dysfunction, and physical dependence. Participants who no longer used their wheelchairs had used them an average of 13 weeks. Medical and psychosocial problems unrelated to wheelchair use were common. Almost 45% of the participants had impaired socialization, 80% had severely compromised occupations, and 41% displayed mild to severe depression. The findings suggest the need for reevaluation of mobility needs and wheelchair use during the years following rehabilitation for a stroke. **Relevance to the Veteran Population.** Despite the best efforts of rehabilitation specialists to maintain a veteran's quality of life after the onset of stroke, the restoration of physical function alone appears to be insufficient to prevent psychological problems such as depression,

decreased levels of activity, and social isolation. Being aware of these issues and providing an environment in which they can be explored may reduce morbidity and prevent secondary complications. Structured follow-up protocols may provide the essential information that facilitates realistic self-evaluations of poststroke capabilities and enhances the veteran's quality of life. Both the veteran who has had a stroke and his or her caregiver could benefit from additional education during rehabilitation and exposure to stroke support groups after discharge from the hospital. An increased awareness of these options and empowering the patient to take advantage of them may also help to reduce the number or severity of psychological and social problems in the future.

*Susan L. Garber, MA, OTR, FAOTA*

### **Effects of anteroinferior capsulolabral incision and resection on glenohumeral joint reaction force**

Patrick J. McMahon, MD; Vance C. Eberly, MD;  
Bruce Y. Yang, BS; Thay Q. Lee, PhD

**Purpose of the Work.** Joint instability is one of the most common human afflictions, affecting all joints of the body. At the shoulder, successful treatments depend on knowledge of the effects of capsulolabral lesions on the joint reaction force that, through concavity compression, is integral to shoulder stability. **Subjects/Procedures.** Loads were applied to the tendons of the rotator cuff and deltoid (anterior and middle portions) of five cadaveric upper limbs. The joint reaction force was measured with a 6° of freedom load cell for the intact condition and each of two test conditions: incision and partial resection of the anteroinferior capsulolabrum. Analysis of variance was used to compare joint reaction forces resolved into that which is directed perpendicular (compression force), anterior, and superior to the glenoid. **Results.** Compression force for the two different capsulolabral lesions was the same,  $133 \text{ N} \pm 13 \text{ N}$ , a small 12% decrease compared to the intact condition ( $151 \text{ N} \pm 13 \text{ N}$ ). This difference was not statistically significant. Results were similar for the components of the joint reaction force directed anterior and superior. **Relevance to the Veteran Population.** Joint reaction force was not meaningfully altered after anteroinferior capsulolabral lesions were simulated in the shoulder. Because of the interplay of static and dynamic restraints, complex injuries may be needed to alter the joint reaction force that is normal for joint stability.

*Patrick J. McMahon, MD*

**Dysphagia research in the 21st century and beyond:  
Proceedings from the Dysphagia Experts Meeting,  
August 21, 2001**

JoAnne Robbins, PhD; Susan Langmore, PhD;  
Jacqueline A. Hind, MS; Martin Erlichman, MS

**Purpose of the Work.** Dysphagia, difficulty in swallowing, is a major healthcare concern, particularly in light of the aging population. Without effective diagnosis and treatment, dysphagia can lead to dehydration, malnutrition, reduced rehabilitative potential, pulmonary complications, and associated reductions in quality of life. A systematic review of current clinical evidence regarding the diagnosis and treatment of dysphagia that was commissioned by the Agency for Healthcare Research and Quality identified critical issues regarding dysphagia research. **Subjects/Procedures.** A meeting of experts, including speech pathologists and an array of physicians including geriatricians, pulmonologists, otolaryngologists, gastroenterologists, statisticians, epidemiologists, healthcare managers, and representatives, from funding agencies convened on August 21, 2001, for a 1-day meeting to

shape the future of dysphagia research. **Results.** Given the many outstanding issues in dysphagia research, such as study design, population selection, standardization, and outcome measures, the experts agreed that future research needs to address two basic components: (1) epidemiological/longitudinal studies of dysphagia and (2) clinical trials to determine the efficacy of assessment and treatment techniques. The blueprint for at least one clinical trial that will focus on “clinical management packages” was outlined. **Relevance to the Veteran Population.** In the year 2000, more than 270,000 Department of Veterans (VA) patients with a primary or secondary diagnosis indicative of swallowing problems visited VA hospitals across the nation. The prevalence of dysphagia in geriatric patients and the aging of United States veterans indicate a compelling need for more research into effective dysphagia management. This meeting of experts in the field of dysphagia provided a critical framework for future clinical trials in dysphagia that will have a significant impact on the diagnosis and treatment of swallowing problems.

*JoAnne Robbins, PhD*

